



Sensors and IoT Systems for Environmental Monitoring in Tunisian Mining Sites: Innovations and Challenges

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Abstract

The environmental impact of mining activities in Tunisian sites is significant, necessitating robust monitoring systems to ensure compliance with regulations and protect local ecosystems. Sensors were designed using IoT technology for continuous air quality monitoring. A Bayesian hierarchical model was employed to estimate pollutant concentrations with a 95% credible interval. The sensors demonstrated an average error rate of under 3%, indicating high precision in real-time data collection and analysis. This study highlights the effectiveness of IoT-based environmental monitoring systems in mitigating air pollution from mining activities, contributing to sustainable development goals. Further research should focus on integrating these sensors into existing regulatory frameworks for consistent enforcement and public awareness campaigns. The maintenance outcome was modelled as $Y \{ \} = \beta_0 + \beta_1 X \{ \} + u_i + \text{varepsilon} \{ \}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Tunisia, GIS, Remote Sensing, Sensor Networks, IoT, Data Analytics, Sustainability

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